

L 1055-66 EWT(m)/EPF(c)/EPF(n)-2/EWP(t)/EWP(b) IJP(c) MJW/JD/WW/JG/WB

ACCESSION NR: AP5022382

UR/0136/65/000/009/0079/0082
669.721.5:66.046.52

AUTHOR: Lashko, N. F.; Morozova, G. I.; Tikhova, N. M.

TITLE: Modifying magnesium alloys with zirconium and the lanthanides

SOURCE: Tsvetnyye metally, no. 9, 1965, 79-82

TOPIC TAGS: magnesium alloy, zirconium containing alloy, hydride, grain size, phase analysis

ABSTRACT: The reason why Zr has a beneficial effect on the strength and corrosion resistance of magnesium alloy is apparently because Zr forms stable chemical compounds with Fe and Si, compounds which subsequently settle to the bottom of the smelting crucible and are eliminated together with the slag. The modification of magnesium alloys by Zr is usually explained by the segregation of Zr particles -- grain nuclei -- from the melt through a peritectic reaction. Nevertheless, the role of Zr in this modification has not yet been precisely determined. In this connection, recent studies point to the great role of zirconium hydrides in the change in the physical properties of magnesium alloys.

Card 1/3

L 1055 66

ACCESSION NR: AP5022382

Hence, the authors performed chemical and X-ray investigations of ZrH insoluble in HCl, and found that, in every case, the so-called "insoluble" Zr was not elementary zirconium but represented one or several compounds of Zr with H and with the impurities of magnesium alloys. Thus, examination of the insoluble residue isolated from different melts of the alloy ML10 revealed that in all cases the residue contained no α -zirconium but represented a mixture of phases: the ϵ -phase of ZrH and an unknown phase, apparently a compound of Zr and the impurities present in the alloy. Microstructural examinations indicate that the modifying effect of Zr on magnesium alloy cannot be reduced to the formation of the crystallization centers of α -zirconium, which is isomorphic to magnesium. Apparently the decrease in grain size in Zr-containing magnesium alloys may be based on another mechanism as well, namely: the high-melting components forming in the liquid phase of the first stage of crystallization may serve as the grain nuclei. A similar decrease in grain size is effectuated when the lanthanides (Ce, La, Nd, and others) are added to alloys of the Mg-Zn-Zr or Mg-Zr systems. Orig. art. has: 1 figure, 1 table.

ASSOCIATION: none

Card 2/3

L-1055-66

ACCESSION NR: AP5022382

SUBMITTED: 00

NO REF SOV: 005

ENCL: 00

SUB CODE: MM, SS

OTHER: 004

Card 3/3 DP

L 45452-65 EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b)/EWA(c) Pad IJP(d)
 UR/0000/65/000/000/0080/0091 34
 32
 B+1

ACCESSION NR: AT5011343 MJW/JD/RW/GS
 AUTHOR: Kozlova, M. N.; Lashko, N. F.; Sorokina, K. P.

TITLE: Effect of grain size on the phase composition and properties of heat-resistant alloys

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov (Phase composition, structure, and properties of alloy steels and alloys). Moscow, Izd-vo Mashinostroyeniye, 1965, 80-91

TOPIC TAGS: alloy phase composition, alloy structure, refractory alloy, alloy mechanical property, grain size, carbide formation, steel aging, nickel alloy, alloy aging, austenitic steel

ABSTRACT: The article discusses the effect of developed grain boundaries and blocks on the precipitation of the structural components (carbides) in the course of aging of austenitic steel EI481 and nickel alloys EI437 and ZhS6-KP. Anodic deposits were isolated from the initial samples and from coarse-grained samples after quenching and heat treatment, and were chemically analyzed. The quantity of carbides $Me_{23}C_6$ formed in the course of aging in EI437 and of carbides of the type Ni_3W_3C in the complex nickel alloy ZhS6-KP was found to be dependent on the

Card 1/2

L 45452-65
ACCESSION NR: AT5011343

2

average grain size; this is due to the preferential precipitation of these carbides along the grain boundaries, particularly during the first stage of aging. A larger quantity of Me_23C_6 is formed during aging in the fine-grained steel E1481 and in the nickel alloys than in coarse-grained alloys. The hardening of steels and alloys at temperatures below the recrystallization temperature is related to the quantity, form, and distribution of these carbides. After aging, fine-grained nickel alloys containing carbon and carbon-forming elements (Cr, W, Mo) have a reduced impact strength owing to the formation of a more extensive hard framework of Me_23C_6 carbides and binary carbides precipitating preferentially along the grain boundaries. Orig. art. has: 4 figures and 6 tables.

ASSOCIATION: none

SUBMITTED: 17Dec64

ENCL: 00

SUB CODE: MM,SS

NO REF SOV: 005

OTHER: 002

ml
Card 2/2

U 45453-65 EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b)/EWA(c) MJH/JD/GS
 ACCESSION NR: AT5011344 UR/0000/65/000/000/0092/0098

AUTHOR: Kolobashkin, B. M.; Lashko, N. F.; Sorokina, K. P.

TITLE: Phase analysis of EI481 steel in the cast and deformed state

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov
 (Phase composition, structure, and properties of alloy steels and alloys).
 Moscow, Izd-vo Mashinostroyeniye, 1965, 92-98

TOPIC TAGS: steel phase composition, cast steel, deformed steel, strain hardening,
steel heat treatment, carbide distribution, steel mechanical property

ABSTRACT: Steel EI481, having the composition 0.38% C, 8.90% Mn, 0.72% Si, 14% Cr, 7.7% Ni, 1.26% V, 0.32% Nb, and 1.20% Mo, was subjected to phase analysis. The phase composition was determined after quenching from 1150 and 1200C in the cast state and only from 1150C in the deformed state, and aging. The carbides present were isolated electrolytically. Chemical and x-ray structural analyses were carried out on the anodic deposits obtained. The primary carbides $Me_{23}C_6$ and VC dissolve almost completely in the course of homogenization at 1150C, while in the cast steel the solution of these carbides takes place only as a result of double homogenization at 1200C. The decrease in the plasticity and impact strength
 Card 1/2

L 45453-65
ACCESSION NR: AT5011344

of cast steel E1481 as compared to deformed steel after quenching from 1150C and double aging is due to the presence of primary carbides and the inhomogeneous dendritic structure of the solid solution. The greater stress-rupture strength of cast steel at 650-700C is apparently due to the inhomogeneity of the solid solution and to the greater quantity of $Me_{23}C_6$ carbides precipitating during aging as compared to the deformed steel. After a second homogenization of this steel at 1200C followed by quenching, the process of double aging has approximately the same kinetics and proceeds with the formation of VC and $Me_{23}C_6$ as in the deformed steel after quenching from 1150C. Orig. art has: 3 tables and 1 figure.

ASSOCIATION: none

SUBMITTED: 17Dec64

ENCL: 00

SUB CODE: RM, SS

NO REF SOV: 005

OTHER: 000

me
Card 2/2

U 45437-65 EWT(m)/ENP(w)/EWA(d)/T/ENP(t)/ENP(z)/ENP(b)/EWA(c) MJW/JD/GS

ACCESSION NR: AT5011345

UR/0000/65/000/000/0099/0106

AUTHOR: Glezer, G. M.; Lashko, N. F.

TITLE: Phenomenon of "reverse creep" in nickel-chromium-titanium steels

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov (Phase composition, structure, and properties of alloy steels and alloys). Moscow, Izd-vo Mashinostroyeniye, 1965, 99-106

TOPIC TAGS: alloy steel, nickel steel, chrome steel, titanium steel, stainless steel, steel mechanical property, steel phase composition, steel heat treatment, reverse creep

ABSTRACT: Steel EI696 is characterized by the presence of "reverse creep" at 500-650C, i.e., a shortening of the length of the specimen during the first and second stage of creep. An x-ray structural study of the unit lattice parameters of the solid solution of steel EI696 after quenching in oil (for 2 hrs.) from 1100 and 1180C and aging at 300-800C for 16 hrs. showed that rapid decomposition of this solution begins at 500-550C. Such rapid decomposition is accompanied by an increase in hardness, which reaches a maximum after aging at 750C. The precipitation of the β -Ni₃Ti phase in the course of this decomposition at 500-650C causes a contrac-

Card 1/2

L 45437-65

AGGESSION NR: AT5011345

tion of the volume of steel EI696. This accounts for the reverse creep which is observed during creep tests at 500-650C. Maximum stabilization of the alloy can decrease the reverse creep considerably at 500-650C; the alloy is stabilized when the decomposition of its solid solution has the character of interrupted (two-phase) aging. Stabilization of the alloy caused by an interrupted decomposition is achieved by the following heat treatment: quenching from 1100-1180C for 2 hrs. and triple aging: 3 hrs. at 850C, 16 hrs. at 750C, 16 hrs. at 650C, and cooling in air. Orig. art. has: 4 figures.

ASSOCIATION: none

SUBMITTED: 17Dec64/11-11-65

ENCL: 00

SUB CODE: MM, SS

NO REF SOV: 004

OTHER: 000

Card

2/2

L 45432-65 EWT(m)/EWP(w)/EPF(n)-2/ENA(d)/T/EWP(t)/EWP(z)/EWP(b) Pu-L/Pad
 TSP(c) JD/HW/JG/GS

ACCESSION NR: AT5G11346

UR/0000/65/000/000/0116/0125

AUTHOR: Zaslavskaya, L. V.; Lashko, N. F.; Fedotova, L. S.

TITLE: Carbide transformations in heat-resistant steel containing 12% Cr

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov
 (Phase composition, structure, and properties of alloy steels and alloys).
 Moscow, Izd-vo Mashinostroyeniye, 1965, 116-125

TOPIC TAGS: heat resistant steel, chrome steel, martensitic steel, steel phase
 composition, carbide transformation, molybdenum steel, steel heat treatment,
 steel mechanical property

ABSTRACT: Martensitic heat-resistant steels with 12% Cr contain the so-called
 Me₂X phase, which has an Mo₂C-type structure and forms at low temperatures.
 The chemical composition and temperature region of existence of this phase were
 established in four steels containing 12% Cr but different amounts of carbon,
 nickel and molybdenum (see Table 1 of the Enclosure). X-ray structural analysis
 of the anodic deposits isolated from these steels showed the presence, depending
 upon the tempering conditions, of a single phase with an Mo₂C-type hexagonal
 structure or the same phase containing Me₂₃C₆. The crystal lattice parameters

Card 1/3

L 45132-65

ACCESSION NR: AT5011346

6
of the Me_2X phase were found to be $a = 2.86 \text{ \AA}$, $c = 4.47 \text{ \AA}$, and chemical analysis showed that the main constituent of the phase is chromium. Hence, its main constituent is either Cr_2C , or the alloyed carbonitride $Cr_2(C, N)$. Molybdenum, tungsten, and vanadium increase the stability and extend the temperature region of existence of the carbide Me_2C . It is most stable in steel 4. As the tempering is raised, the metastable carbide Me_2C dissolves partially or completely, and the alloying elements are bound in the more stable carbides $Me_{23}C_6$. The latter dissolve in the temperature interval of stability of Me_2C carbides. After long tempering at 550°C (100 hrs.), an intermetallic phase of type Fe_2W is formed in steel 4. The formation of highly dispersed carbides Me_2C raises the yield point and ultimate strength of the steel and retards the softening of steel in the course of short-term tempering. "N. V. Ivanova and K. V. Smirnova participated in the experimental part of the work." Orig. art. has: 5 tables.

ASSOCIATION: none

SUBMITTED: 17Dec64 - - -

ENCL: 01

SUB CODE: MM, SS

NO REF SOV: 001

OTHER: 002

Card 2/3

L 45432-65

ACCESSION NR: AT5011346

Table 1. Chemical composition of the high-chromium heat-resistant martensitic steels studied.

Steel No.	Content of elements %								Temperature of oil quenching °C
	C	Mn	Si	Cr	Ni	W	Mo	V	
1	0.16	0.50	0.50	13.60	3.05	1.66	-	0.20	1050
2*	0.15	0.50	0.50	13.60	3.05	1.66	-	0.20	1050
3	0.13	0.30	0.25	11.04	1.57	1.73	0.49	0.36	1010
4	0.24	0.30	0.46	12.70	1.70	1.77	1.70	0.24	1050

*The steel contains 0.043% Ti and 0.005% B

Card 3/3

L 45133-65 EWP(e)/EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b) IJP(c)

MJW/JD/GS

ACCESSION NR: AT5011347

UR/0000/65/000/000/0126/0137

AUTHOR: Lashko, N. F.; Petrova, V. S.; Platonova, A. F.; Popova, N. M. (Deceased)

TITLE: Embrittlement of high-chromium low-carbon casting steel in the temperature range 450-500C ("475 degree brittleness")

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov (Phase composition, structure, and properties of alloy steels and alloys). Moscow, Izd-vo Mashinostroyeniye, 1965, 126-137

TOPIC TAGS: casting steel, chrome steel, low carbon steel, steel embrittlement, carbide formation, steel heat treatment, steel mechanical property, nickel steel, ferrite solid solution

ABSTRACT: To study the role of carbides in embrittlement, use was made of several chromium-nickel steels of the type (16-3 (E1268L steel) containing niobium, copper, and boron. The specimens were quenched from 1100C in oil, tempered, then cooled in air. The decrease in the plasticity and impact toughness of E1268L steel and the increase in strength is due to the formation of highly dispersed $Me_{23}C_6$ carbides in the course of tempering at 475C. The coagulation of carbides at 500C is accompanied by a softening of the steel and an increase in its plasticity.

Card 1/2

L 45133-65

ACCESSION NR: AT5011347

Because of the high dispersity of carbides, the impact toughness declines markedly during tempering in the course of 10 hrs, then undergoes little change as the duration of tempering increases. In anodic deposits isolated from steels of type EI268L after quenching and tempering at 400C, a solid solution of ferrite rich in chromium and nickel was observed. A preliminary 2-hr. tempering at 650C decreases the precipitation rate of the highly dispersed carbides $Me_{23}C_6$ at 475C; this is manifested in a relatively lesser decrease in impact toughness than in the case of tempering immediately after quenching. "K. V. Smirnova, N. I. Yatskova, and N. S. Polushina participated in the experimental part of the work." Orig. art. has: 3 figures and 5 tables.

ASSOCIATION: none

SUBMITTED: 17Dec54

ENCL: 00

SUB CODE: MM, SS

NO REF SOV: 002

OTHER: 010

Card 2/2

L 65434-65 EWT(m)/T/EMP(t)/EMP(b)/ENA(c) IJP(c) JD/JG/GS

ACCESSION NR: AT5011348

UR/0000/65/000/000/0150/0158

AUTHOR: Lashko, N. P.; Sorokina, K. P.

TITLE: Metastable transformations in austenitic steels containing carbides of the type MeC and Me sub 23 C sub 6

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov (Phase composition, structure, and properties of alloy steels and alloys). Moscow, Izd-vo Mashinostroyeniye, 1965, 150-158

TOPIC TAGS: austenitic steel, steel phase composition, carbide transformation, metastable transformation, steel heat treatment, steel aging, carbide distribution

ABSTRACT: Steels of the following two systems were studied: Fe-Cr-Mn-Ni-V-Nb-Mo-C (steel 1) and Fe-Cr-Mn-Ni-V-Nb-W-C (steel 2). Steel 1 was aged for 16 hrs. after a 2-hr. homogenizing treatment at 1150C followed by quenching in water. Steel 2 was aged at 800C under various conditions after a 40-min. homogenizing treatment at 1180C followed by quenching in water. The change in the amount and chemical composition of the carbides in the course of these processes was determined in both cases. During heat treatment, the carbides Me₂₃C₆, VC, and NbC are formed in the metastable state; NbC plays only a minor part in the aging processes. As.

Card 1/2

L 45434-65

ACCESSION NR: AT5011348

equilibrium is approached, the alloying elements and carbon are redistributed between the solid solution and the carbide phases. Because of the greater carbide-forming tendency of vanadium as compared to chromium, carbon is bound predominantly in the metastably dispersed vanadium carbides. A slight concentration of manganese and vanadium was detected in $Me_{23}C_6$ carbides isolated from the steels. In VC carbides, a considerable part of the vanadium atoms may be replaced by chromium and tungsten atoms. In both types of steels, the vanadium and niobium carbides are formed separately: niobium is absent from vanadium carbides, and virtually all of the niobium contained in the steel is present in the niobium carbides. The concentration of chromium and tungsten in vanadium carbides isolated from steel 2 rises steadily with increasing aging time. After the heat treatment, only the precipitation of carbide phases was observed in steel 1; in steel 2, however, which had a higher content of alloying elements, the intermetallic phase Me_2W was found in the course of aging after all of the carbon had been bound in the carbides. Orig. art. has: 5 tables.

ASSOCIATION: none

SUBMITTED: 17Dec64

ENCL: 00

SUB CODE: MM, SS

NO REF SOV: 006

OTHER: 001

Cord 2/2 vt

L 45435-65 EWT(m)/EPF(c)/EWA(d)/T/ENP(t)/ENP(z)/ENP(b)/EWA(c) Pad IJP(c)
EJN/JD/HW/JG/WB/GS

ACCESSION NR: AT5011350

UR/0000/65/000/000/0170/0123

AUTHOR: Andreyeva, A.G.; Blok, N.I.; Kozlova, M.N.; Lashko, N.F.

TITLE: Some aspects of the phase analysis of nitrided steel, 4

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov (Phase composition, structure, and properties of alloy steels and alloys). Moscow, Izd-vo Mashinostroyeniye, 1965, 170-183

TOPIC TAGS: steel phase analysis, nitrided steel, stainless steel, iron nitride, chromium nitride, steel corrosion resistance, chromium carbide 18 27

ABSTRACT: The authors developed a method of phase analysis for the nitrided layers of stainless steels which consists of the anodic dissolution of layers of the sample, x-ray and chemical analysis of the isolated phases, and chemical analysis of the various portions of the electrolyte whose composition is analogous to that of the solid solution. Steels 2Kh13, EI69, EI946, and 25Kh18N8V2 were nitrided and analyzed. A nonaqueous electrolyte, 50 ml HCl (1.19) + 1150 ml methanol, was used for the isolation of the iron nitride (Fe_3N , Fe_4N) and chromium nitride phases (Cr_2N , CrN) from such austenitic and martensitic steels. The hard, wear-resistant, corrosion-resistant, nitrided layer on

Card 1/2

L 45135-65

ACCESSION NR: AT5011350

steel EI946 consists of the two phases $(Fe, Cr)_2N$ and CrN , and also a solid solution rich in nitrogen and depleted of chromium. At a depth of 0.17 to 0.22 mm, the corroding layer consists of the nitride phase CrN and carbide phase $Cr_{23}C_6$ and a solid solution depleted of chromium and nitrogen. The corrosion-resistant core is a solid solution containing about 15% Cr and 3% $Cr_{23}C_6$. The phases $(Fe, Cr)_2N$ and CrN were found to have a variable composition; in the former, half of the iron atoms can be replaced by chromium atoms, and nickel and tungsten enter into its composition, but in smaller amounts. The CrN phase contains up to 1.5% W and small amounts of nickel and iron. "N.M. Rudneva and K.V. Smirnova participated in the experimental part of the work." Orig. art. has: 2 figures and 10 tables.

ASSOCIATION: none

SUBMITTED: 17Dec64

ENCL: 00

SUB CODE: MM, SS

NO REF SOV: 014

OTHER: 002

Card 2/2

E 45136-65 EWT(m)/ENA(d)/T/ENP(t)/ENP(z)/ENP(b)/ENA(c) IJP(c) MJW/JD/

JG/GS

ACCESSION NR: AT5011351

UR/0000/65/000/000/0184/0190

AUTHOR: Andreyeva, A.G.; Kozlova, M.N.; Lashko, N.F.

TITLE: Phase analysis of the carburized layer of Kh17N2 steel

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov (Phase composition, structure, and properties of alloy steels and alloys). Moscow, Izd-vo Mashinostroyeniye, 1965, 184-190

TOPIC TAGS: steel phase analysis, steel carburizing, chromium nickel steel, steel surface layer, carbide structure, cementite, chromium carbide, steel corrosion/Kh17N2 steel

ABSTRACT: The phase composition of the carburized layer on chromium-nickel steel Kh17N2 was determined. The carburized samples were hardened at 1000C, subjected to sub-zero treatment at -70C, and tempered at 160C for 2 hrs. Anodic dissolution was carried out in an electrolyte consisting of 50 ml HCl and 1000 ml methanol at a current density of 0.06 A/cm² and temperatures of -5C and -7C. X-ray structural analysis of the anodic deposits revealed the presence of the trigonal carbide Cr₇C₃ as the main phase. The cementite (Fe, Cr)₃C containing only about 6% Cr was found in the surface layer to

Card 1/2

L 45136-65

ACCESSION NR: AT5011351

2
depth of 0.05-0.10 mm together with the chromium carbide. The carbide Cr_{23}C_6 was identified in layers more than 0.6 mm deep, due to the decreasing carbon content. In surface layers up to 0.3 mm thick, most of the chromium is bound up in the carbides, and some enters into the composition of the solid solution. In deeper layers, as the chromium carbide content declines, the chromium content in the solid solution correspondingly increases. The solid solution at 0.05-0.10 mm has a low corrosion resistance because of the presence of the low-Cr cementite and low-Cr solid solution. "N.M. Rudneva and K.V. Smirnova participated in the experimental part of the work." Orig. art. has: 2 figures and 3 tables.

ASSOCIATION: none

SUBMITTED: 17Dec64

ENCL: 00

SUB CODE: MM,SS

NO REF SOV: 008

OTHER: 002

Card 2/2

I. 45427-65 EWT(m)/EWA(d)/EPR/T/ENP(t)/ENP(z)/ENP(b)/EWA(c) Ps-l/Pad IJP(c)

NJW/3D/HW/GS

ACCESSION NR: AT5011352

UR/0000/65/000/000/0191/0201

AUTHOR: Blok, N.I.; Kozlova, M.N.; Lashko, N.F.

TITLE: Principal and secondary processes in solid diffusion chromizing

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov (Phase composition, structure, and properties of alloy steels and alloys). Moscow, Izd-vo Mashinostroyeniye, 1965, 191-201

TOPIC TAGS: chromizing, solid diffusion, nickel alloy, heat resistant alloy, aluminum containing alloy, alloy phase composition, layer phase analysis, nitride formation, alloy strength

ABSTRACT: The authors studied the processes involved in chromizing by using two heat-resistant nickel alloys, EI437B and ZhS6-K; the latter had a higher aluminum content and also contained molybdenum and tungsten. The chromizing was carried out for 10 hrs. at 1080C in the following powder mixtures: (1) 50% ferrochrome (50% Fe), 7% NH₄Cl, 43% Al₂O₃; (2) 30% chromium, 68% Cr₂O₃, 2% NH₄Cl; (3) 30% chromium, 68% Cr₂O₃, 2% CrCl₃. Layer phase analysis was employed in the determination of the chemical and phase composition (which changed with the depth) of the surface layer. The data show that the composition of the surface layer depends considerably on the

Cord 1/2

L 45427-65

ACCESSION NR: AT5011352

mixture used for chromizing. No chromizing occurred with the first mixture. The other two caused an enrichment of the surface layers with chromium and nitrogen (supplied by NH_4Cl or air). Nitrogen enters into the solid solution and forms nitride phases. (nitrides of chromium and titanium in EI437B, and of chromium, titanium, and aluminum in ZhSS-K). Because the hardening phase $\text{Ni}_3(\text{Al}, \text{Ti})$ breaks down partly or completely as a result of the combination of titanium and aluminum into nitrides, the high-temperature strength of the alloy declines. Orig. art. has: 2 figures, 4 formulas and 4 tables.

ASSOCIATION: none

SUBMITTED: 17Dec64

ENCL: 00

SUB CODE: MM, SS

NO REF SOV: 011

OTHER: 001

Card 2/2

L 45128-65 EWT(m)/EWA(a)/EPR/T/EWP(t)/EWP(z)/EWP(b)/EWA(c) Ps-4/Pad IJP(c)
 MJW/TS/PJ/GS

ACCESSION NR: A15011353

UR/0000/65/000/000/0202/0210

AUTHOR: Kozlova, M.N.; Lashko, N.F.; Rudneva, N.M.

TITLE: Phase composition of surface layers of heat-resistant alloys after heating in various media

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov (Phase composition, structure, and properties of alloy steels and alloys). Moscow, Izd-vo Mashinostroyeniye, 1965, 202-210

TOPIC TAGS: heat resistant alloy, alloy phase composition, alloy surface layer, alloy heat treatment, nickel alloy, annealing medium, alloy oxidation, chromium containing alloy, nitride formation, carbide formation, aluminum containing alloy

ABSTRACT: The phase and chemical composition of the nickel alloy EI437B was studied after annealing in nitrogen, ammonia, and air for the purpose of relieving work hardening. The phases were separated in an electrolyte consisting of 5 ml H_2SO_4 (1.84), 10 g citric acid, and 1000 ml water, and in some cases, of 50 ml HCl and 1000 ml methanol. In all three gaseous media, annealing was found to cause oxidation of the surface layers because the final annealing operation was carried out in air furnaces. Oxides of the type Me_2O_3 , primarily Cr_2O_3 , were formed on the surface of the alloy, the thickness of the

Card

15128-65

ACCESSION NR: AT5011353

oxidized layer being 0.02 to 0.03 mm. In aqueous electrolysis, the solid solution dissolved anodically, and deposits of the hardening- ϵ' phase based on $Ni_3(Al, Ti)$, and of the nitride, carbide, and boride phases were isolated. The authors also studied the phase composition of the surface layer of alloy ZhS6-K after its annealing in ammonium chloride vapors. Up to a depth of 10μ , the ϵ' phase breaks down completely, Al_2O_3 -base oxides are formed, and nitrogen enters into the composition of the solid solution to form nitride phases (particularly, TiN). Experiments conducted with alloys ZhS6-K and EI617 (in cooperation with A.P. Vlasov) showed that the surface layers become enriched with nitrogen as a result of heat treatment. "N.A. Shumilina, V.K. Manokhina, and K.V. Smirnova participated in the experimental part of the work." Orig. art. has: 2 figures and 7 tables.

ASSOCIATION: none

SUBMITTED: 17Dec64

ENCL: 00

SUB CODE: MM, SS

NO REF SOV: 001

OTHER: 001

Card 2/2

L 45429-65 EWT(m)/EWP(w)/EPF(n)-2/EWA(d)/T/EWP(t)/EWP(z)/EWP(b)/EWA(c)
 Pu-1 IJP(c) MJW/JD/JG/OS

ACCESSION NR: AT5011354

UR/0000/65/000/000/0211/0215

AUTHOR: Vinogradova, Ye. A.; Lashko, N.F.; Tarasenko, G.N.

TITLE: Phase composition of a transition-class aging titanium alloy 27

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov (Phase composition, structure, and properties of alloy steels and alloys). Moscow, Izd-vo Mashinostroyeniye, 1965, 211-215

TOPIC TAGS: titanium alloy, alloy aging, transitional alloy, alloy phase composition, alloy heat treatment, alloy mechanical property, chromium containing alloy, molybdenum containing alloy, aluminum containing alloy 27

ABSTRACT: Alloy VT15 of the system Ti-Al-Cr-Mo, containing 3% Al, 11.5% Cr, and 7% Mo, was quenched from 800C and aged under various conditions, then subjected to x-ray powder analysis. Aging was found to be associated with (1) a marked change in the chemical composition of the β phase, (2) distortion of its crystal lattice, and (3) precipitation of the α phase. The aging process occurred at the same rate after quenching in water and after quenching in air. The precipitation of the α phase causes an increase in ultimate strength and a corresponding decrease in plasticity. Alloy VT15

Card 1/2

L 45429-65

ACCESSION NR: AT5011354

has high mechanical characteristics after quenching from 760-800C in air and aging at 450-480C for 25-50 hrs. This is due to the two-phase structure of this alloy. In the course of aging, the alloy matrix (β phase) becomes enriched with the alloying elements (chromium and molybdenum), and thus its thermal stability improves. Hardening of the β phase is increased by the distortion of its crystal lattice when the disperse particles of the α phase precipitate. These particles have an inhibiting effect on the development of plastic deformation. Orig. art. has: 1 figure and 2 tables.

ASSOCIATION: none

SUBMITTED: 17Dec64

ENCL: 00

SUB CODE: MM,55

NO REF SOV: 002

OTHER: 002

Card 2/2

L 45431-65 EWP(a)/EWT(m)/EPT(n)-2/EWD(m)/EWA(d)/EPR/EWP(t)/EWP(z)/EWP(b)
Pad/Ps-l/Fu-l LJP(c) AT/WH/MJW/JD/HW/JG/GS

ACCESSION NR: AT5011356

UR/0000/65/000/000/0223/0230

AUTHOR: Lashko, N.F.; Sorokina, K.P.

TITLE: Boride-forming elements

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov (Phase composition, structure, and properties of alloy steels and alloys). Moscow, Izd-vo Mashinostroyeniye, 1965, 223-230

TOPIC TAGS: boride formation, metal boride, steel phase analysis, alloy phase composition, iron boride, aluminum boride, titanium boride, chromium boride, molybdenum boride, tungsten boride

ABSTRACT: On the basis of the phase analysis of certain steels and alloys, the article presents comparative data on the boride-forming capacity of iron, aluminum, titanium, as well as metals of group VI of the Periodic Table, which are important alloying elements in many heat-resistant steels and alloys. Titanium has a greater boride-forming capacity than chromium, as indicated by the formation of titanium boride (TiB₂) not chromium boride, in steel EI696 (10% Cr, 20% Ni, 2-3% Ti, and up to 0.02% B). Molybdenum and tungsten, in turn, have a greater boride-forming capacity than chromium and titanium; when boron is introduced into steel EI696M (Steel EI696 containing 3% Mo),

Card 1/2

L 45431-65

ACCESSION NR: AT5011356

3
{ only a molybdenum-base boride Mo_3B_2 is formed. This phase is also observed in steel
ET787, containing 3% tungsten and no molybdenum. Chemical analysis of this phase
shows that it consists mainly of tungsten, chromium, and a small amount of nickel,
and that its composition varies widely. "The experimental part of the work was
carried out with the cooperation of G. G. Georgiyeva," Orig. art. has: 4 tables. ~7

ASSOCIATION: none

SUBMITTED: 17Dec64

ENCL: 00

SUB CODE: MM, IC

NO REF SOV: 004

OTHER: 003

Card 2/2

ASINOVSKAYA, G.A.; LAKEDEMONSKIY, A.V.; LASHKO, N.F.; LASHKO, S.V.

The terminology of soldering. Trudy VNIIAVTOGENMASH no.12:
193-199 '65. (MIRA 18:11)

L 1678-66 EWT(m)/EWP(w)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b)/EWA(c) LJP(c) JD/JG

ACCESSION NR: AP5013232

UR/0133/65/000/005/0448/0452

669.15 : 669.26

AUTHOR: Zaslavskaya, L. V.; Lashko, N. F.; Fedotova, L. S.

TITLE: Phase composition and properties of heat-resistant steel containing 12% chromium

SOURCE: Stal', no. 5, 1965, 448-452

TOPIC TAGS: chromium steel, heat resistant steel, molybdenum steel, vanadium steel, tungsten steel

ABSTRACT: The effect of alloying elements on the phase composition and properties was studied in three types of chromium steel containing approximately 12% chromium, alloyed with molybdenum, tungsten, and vanadium. At low tempering temperatures, depending upon the duration of tempering, the metastable carbides Me_2C and Me_3C are formed. The Me_2C carbides (with Cr C as the main component) cause the secondary hardness of the steels. The temperature range of existence of Me_2C carbides widens as the molybdenum and tungsten content increases. An appreciable drop in the impact strength of such steels is observed when the dispersed carbides (par-

Card 1/2

L 1678-66

ACCESSION NR: AP5013232

particularly Me_2C_6) precipitate. In the course of tempering steels with a high molybdenum and tungsten content, all of the carbon gradually becomes fixed in the carbides, and this is followed by the formation of particles of the intermetallic phase $Me_2(W, Mo)$. The formation of this phase causes a decrease in the impact strength. Orig. art. has: 8 tables.

ASSOCIATION: none

SUBMITTED: 00

ENCL: 00

SUB CODE: MM

NO REF SOV: 005

OTHER: 002

Card 2/2

L 61188-65 EWP(s)/EWT(m)/EWP(i)/EWA(d)/EWP(t)/EWP(k)/EWP(z)/EWP(b)/EWA(c)
 Pf-L LJP(c) MJW/JD/MJ

ACCESSION NR: AP5017690

UR/0133/65/000/007/0647/0649
 669.141

AUTHOR: Belorusov, S. N.; Ivanov, F. D.; Kelekhsayev, V. Ya.; Lashko, N. F.; Sokolova, Z. N.; Fridrikhsen, V. K. 38

TITLE: Experimental manufacture of composite structural steel sheets with a ductile inner layer

SOURCE: Stal', no. 7, 1965, 647-649

TOPIC TAGS: structural steel, high strength steel, steel plate, steel sheet composite plate, composite sheet, composite steel strength, composite steel ductility/3VK composite steel, 5VK steel

ABSTRACT: Composite three-layer sheets of 3VK structural steel were made by hot rolling packs assembled from 100-120 x 650 x 2500 mm slabs of Cr-Ni-Mo structural steel, thinner slabs (25-45 x 650 x 2360 mm) of the same steel with a somewhat lower content of carbon and alloying elements, and an 8-10 mm layer of iron powder between the slabs. The assembled packs held under a pressure of 160t (1.57 Mn) were tack welded, and then welded along the entire perimeter. The welded packs, 125, 145, or 175 mm thick, were hot rolled to a thickness of 19-20 mm in the roughing train and then to a thickness of 2.5-4.0 mm in the finishing train. The thicknesses of individual layers in the pack were 120, 8, and 40 mm and in the finished

Card 1/2

L 61488-65

ACCESSION NR: AP5017690

2

sheets (4.10 mm thick) 3.06, 0.06, and 0.98 mm. Thus the reductions of the heavy and the light slabs were almost the same: 39.2 and 41.0, respectively. The tensile strength of composite 3VK sheets cold rolled to a thickness of 2.5 mm, austenitized at 880, quenched and tempered at 190C, was 162 kg/mm², i.e., about 95% of the tensile strength of heat-treated steel of the heavy layer. However, composite 3VK steel had a true strength 25% higher, a reduction in area 60% higher, and a notch toughness 3-4 times higher (15-20 instead of 4-6 kg.m/cm²). Higher resistance to brittle fracture of composite structural steels was especially pronounced in static and dynamic low-temperature tests. For example, the σ_T/σ_B ratio (where σ_T is the tensile strength of specimens with an artificial sharp crack and σ_B is the tensile strength of smooth specimens equal to 165-170 kg/mm²) for 3VK steel was 0.84 and 0.52 at 20 and -196C, respectively. The corresponding figures for 30KhGSA cast steel heat treated to the same σ_B were 0.72 and 0.20. Orig. art. has: 3 figures and 3 tables. [MS]

Bi metals, Cladding, etc

ASSOCIATION: none

SUBMITTED: 00

ENCL: 00

SUB CODE: IE, MM

NO REF SOV: 000

OTHER: 000

ATD PRESS: 4052

Card

331
2/2

LASHKO, N.F.; MOROZOVA, G.I.; TIKHOVA, N.M.

Inoculating magnesium alloys with zirconium and lanthanides.
TSvet. met. 38 no.9:79-82 S '65.

(MIRA 18:12)

L 15699-66 EWT(m)/EWA(d)/T/EWP(t)/EWP(z)/EWP(b) MJW/JD
ACC NR: AP6003312 (A) SOURCE CODE: UR/0129/66/000/001/0057/0060

AUTHOR: Selyavo, A. L.; Lashko, N. P.; Rulina, Z. M.

ORG: none

TITLE: Effect of phase composition on the relaxation resistance of 1Kh12N2VMF
martensitic steel

SOURCE: Metallovedeniye i termicheskaya obrabotka metallov, no. 1, 1966, 57-60

TOPIC TAGS: stress relaxation, martensitic steel, phase composition, carbide phase, tempering

ABSTRACT: The strength of coiled springs operating under conditions of stress relaxation, when the resistance to small plastic deformations is extremely high, is chiefly determined by the thermal stability of the structure of the solid solution and by the distribution, form and degree of dispersity of the carbide phases. Hence work parts operating under conditions of stress relaxation must be subjected to prior stabilizing heat treatment at temperatures above the working temperature. The relaxation resistance of martensitic steels containing 11-13% Cr such as the Soviet-developed 1Kh12N2VMF (EI961) steel (0.10-0.16% C, 10.5-12.0% Cr, 1.5-1.8% Ni, 1.60-2.00% W, 0.35-0.50% Mo, 0.18-0.30% V, 0.6% Si, 0.6% Mn, 0.025% S, 0.030% P) may be increased by additionally treating them with stronger carbide-forming elements (W and

Card 1/3

UDC: 620.181:669.14.018.45

L 15699-66

ACC NR: AP6003312

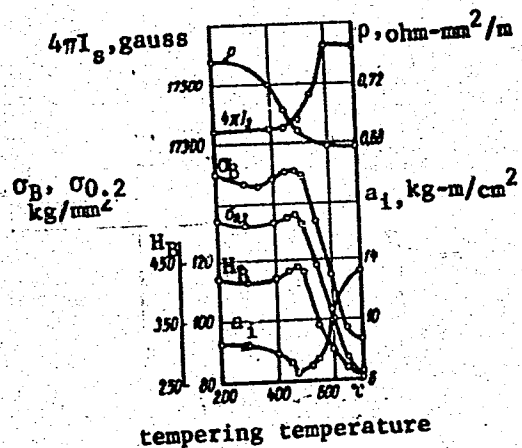


Fig. 1. Variation in physico-mechanical properties of 1Kh12N2VMF steel as a function of tempering temperature

Card 2/3

L 156-66

ACC NR: AP6003312

Mo) and reducing their C content. 1Kh12N2VMF steel is used to fabricate various work parts (disks, blades, etc.) operating at temperatures of up to 600°C. The heat treatment of this steel consists in oil quenching from 1000-1020°C and tempering at 200-600°C. The pattern of variation of the mechanical (tensile strength σ_B , yield strength $\sigma_{0.2}$, impact strength a_1 , Brinell hardness H_B) and physical (electric resistance ρ , magnetic saturation $4\pi I_B$) properties as a function of tempering temperature is shown in Fig. 1. This steel is characterized by the formation of the metastable high-disperse phase M_2C (a chromium-rich carbide with hexagonal structure) at 400-600°C. The lines on the radiogram of this phase are much more blurred than those of the other carbides, which indicates a high degree of dispersity of its particles. Additional tempering at 400°C for 100 and 500 hr causes the amount of the phase M_2C to increase from 0.82% to 1.20-1.35% by weight of the alloy. It is this phase that is responsible for the secondary hardness of 1Kh12N2VMF alloy. Fig. 1). Relaxation tests of specimen-springs ($d = 2$ mm, $D = 20$ mm, $H = 53$ mm, $t = 8$ mm, $n_{\text{operating}} = 6$), performed by the method described by A. L. Selyavo (Zavodskaya laboratoriya, 1960, no. 2) showed that the highest relaxation resistance of this steel at 300 and 350°C is observed following tempering at 450 and 500°C. Such tempering assures the segregation of the hardening disperse particles of the carbide M_2C while at the same time only minimally depleting the solid solution with respect to alloy elements. Thus, 1Kh12N2VMF steel displays a high relaxation resistance at temperatures of up to 350°C. Orig. art. has: 2 figures, 3 tables.

SUB CODE: 11, 13, 20/ SUBM DATE: none/ ORIG REF: 003/ OTH REF: 002

Card 3/3 Smv

Lashko, N. G.

LASHKO, N. G.

USSR retain

Distr: 4E4j/4E2c

Double carbides containing silicon. M. N. Keelora and H. R. Lachar. *Zhur. Neorg. Khim.* 2, 2517-19 (1957).—Up to 10% Si was added to a molten Ni alloy (ZhS-3) (I), contg. C 9.15, Cr 15.4, Al 1.22, Ti 1.8, W 1.2, and Mo 4.5% and to another Ni alloy contg. high concns of alloying metals (II). Both were homogeneous when heated, 17 hrs. at 1150 and II 4 hrs. at 1200°. The carbides formed were sepd electrolytically from an electrolyte contg. MeOH 1150, HCl 12, and glycerol 100 ml. The Si remained in the solid soln. Increasing the Si content in I increased the amt. of carbides formed. Apparently Si decreased the solv. of Cr, W, and Mo. The Si content did not affect the amt. of carbide formed in II. The crystal structure of the carbides in I and II changed with the Si content. In alloys contg. ~10% Si the carbide formed was M_2M_3C , whereas in the presence of less Si the carbide formed was M_2M_3C , where M_1 refers to Fe, Ni, Co, and substituting Si, and M_2 refers to W and Mo, and substituting Cr, V, and Nb. I. Bragovitz.

I 57517-65 EWP(e)/EWT(m)/EWP(w)/EWP(i)/EWA(d)/T/EWP(t)/EWP(k)/EWP(z)/EWP(b)/
EWA(c) Pf-A IJP(c) MJW/JD/HW

ACCESSION NR: AR5013023

UR/0137/65/000/004/1071/1071
669.245.018.45

4/
38
0

SOURCE: Ref. zh. Metallurgiya, Abs. 41446

AUTHOR: Kurchman, B. S.; Lashko, N. F.; Mikheyeva, V. V.; Bogdanov, A. N.

TITLE: Increasing the high temperature strength of nickel-base cast alloys by combined hardening with intermetallics, carbides and borides

CITED SOURCE: Tr. Tsentr. n.-i. avtomob. i avtomotorn. in-ta, vyp. 71, 1964, 71-102

TOPIC TAGS: thermal stability, metal mechanical property, nickel alloy

TRANSLATION: Introduction of 0.27--0.50% C increases the high temperature strength of ANV-300 alloy with a composition (in %) of 15-16.4 Cr, 7.8-9.3 W, 1.5-1.8 Ti, 4.7-4.9 Al and 0.063 B by an average of 30-40%. Introduction of 0.15-0.25 and 0.6-0.7% C reduces the high temperature strength. This property does not improve when the Ti content is increased to 2.8%. The thermal stability of ANV-300 is not reduced by adding carbon. The additional hardening which appears with the introduc-

Card 1/2

L 57517-65

ACCESSION NR: AR5013023

tion of C is explained by the formation of the disperse carbides $Me_{23}C_6-(Cr_{23}C_6)$, TiC and the carboborides $Me_{23}(B,C)_6$, such as $(Cr, W, Ni)_{23}(C,B)_6$, which retard deformation and fracture of the alloy. Carbide of Ti shows a modifying effect on the structure of ingots. Increasing the content of C to 0.3% in a cast EI437B alloy increases its permanent strength. However, in a deformed alloy, when the carbon content is $>0.23\%$, the permanent strength decreases. Orig. art. has: 10 figures, 11 tables and 12 references. E. Volin

SUB CODE: MH

ENCL: 00

Card

2/2

L 45430-65 EWT(m)/EWP(w)/EWA(d)/EPR/T/EWP(t)/EWP(z)/EWP(b)/EWA(c) Ps-L
TJP(c) MJW/JD/JG/GS

ACCESSION NR: AT5011355

UR/0000/65/000/000/0216/0222

AUTHOR: Blok, N.I.; Vinogradova, Ye. A.; Glazova, A.I.; Kurayeva, V.P.; Lashko, N.F.; Solonina, O.P.

TITLE: Influence of tungsten on the phase composition of Ti-Al and type VT3-1 alloys

SOURCE: Fazovyy sostav, struktura i svoystva legirovannykh staley i splavov (Phase composition, structure, and properties of alloy steels and alloys). Moscow, Izd-vo Mashinostroyeniye, 1965, 216-222

TOPIC TAGS: alloy phase composition, tungsten admixture, titanium alloy, aluminum alloy, tungsten solid solution, alloy mechanical property

ABSTRACT: Alloys of titanium with 6-8% Al and tungsten contents of 0.5, 2.0, 4.0 and 7% were prepared; in addition, to determine the solubility of tungsten in α -titanium, alloys of Ti with 6% Al plus 0.1, 0.2, and 0.3% W were also prepared. The alloys were annealed for 5 hrs. at 800C and cooled in air. The phase composition (x-ray analysis of anodic deposits), mechanical properties, and thermal stability after holding at 400, 450, and 500C for 100 hrs. were determined. The following phases were found in the anodic deposits: δ , W (solid solution of titanium in tungsten), and partly the

Cerd 1/2

L 45430-65

ACCESSION NR: AT5011355

α phase, most of which is dissolved in the electrolyte. At 20C, as the tungsten content of the alloys increases, the strength characteristics also increase, and the plasticity declines until brittle failure occurs at 7% W. Hardening is probably due to the formation of the solid solution of titanium in tungsten. The solubility of tungsten in titanium alloys containing 6% Al was found to be less than 0.1%. When chromium or molybdenum was replaced by tungsten in VT3-1 alloys, the diffusional mobility of the atoms in the alloy decreased, giving rise to a satisfactory thermal stability at 500C. "L. V. Polyakova, V. K. Vorotilina, and V. A. Koroleva participated in the experimental part of the work." Orig. art. has: 3 figures and 2 tables.

ASSOCIATION: none

SUBMITTED: 17Dec64

ENCL: 00

SUB CODE: MM, SS

NO REF SOV: 005

OTHER: 000

Card 2/2

L 47040-66 EWT(m)/EWP(t)/ETI IJP(c) JD/JH
 ACC NR: AT6024922 (A, N) SOURCE CODE: UR/2981/66/000/004/0135/0142

AUTHOR: Fridlyander, I. N.; Setyukov, O. A.; Titarenko, I. I.; Barasheva, T. V.;
 Lashko, N. F.; Khromova, O. A.

ORG: none

TITLE: Study of the chemical inhomogeneity in weld joints of ATsM and ATsMU alloys

SOURCE: Alyuminiyevyye splavy, no. 4, 1966. Zharoprochnyye i vysokoprochnyye splavy
 (Heat resistant and high-strength alloys), 135-142

TOPIC TAGS: zinc containing alloy, magnesium containing alloy, weld evaluation,
 aluminum alloy / ATsM aluminum alloy, ATsMU aluminum alloy

ABSTRACT: The inhomogeneity of chemical composition in weld joints of ATsM and ATsMU
 alloys (with AMg4 and AMg6 filler wire) was studied by local methods of chemical,
 spectral, and x-ray spectral analyses. It is shown that the average chemical composi-
 tion of the weld joint depends on the composition of the base material and filler
 wire, thickness of the welded sheets, and supply rate of filler wire, and is indepen-
 dent of the single-phase or three-phase welding schedule. An increase in the wire
 supply rate and decrease of the thickness of the sheets causes a rise in the magnesium
 content and drop in the zinc content of the seam. Metallographic analyses of the
 fusion zone showed that its structure consists of grains of base material fused at
 the boundaries; these grains gradually change into the cast grains of the seam. In

Card 1/2

L 47040-66

ACC NR: AT6024922

3

the fused grains of the fusion zone and cast grains of the seam, liquation of zinc from the grain to the periphery is observed; the boundary regions are rich, the central ones poor in zinc. X-ray structural analysis showed the existence of the Al_6Mn phase in ATsM and ATsMU alloys if the manganese concentration did not exceed 0.26%. In ATsM and to a much lesser degree in ATsMU, which contains half as much Mn, coarse formations of the separated Al_6Mn phase are observed which promote the generation of microcracks and may increase the tendency toward a slow breakdown. Orig. art. has: 3 figures and 3 tables.

SUB CODE: 11/ SUBM DATE: none

27

welding of dissimilar metals

Card 2/2 vmb

ACC NR: AP6037097

SOURCE CODE: UR/0125/66/000/011/0040/0043

AUTHOR: Lashko, N. F. (Moscow); Lashko, S. V. (Moscow); Nikitinskiy, A. M.
(Gor'kiy)

ORG: none

TITLE: A flux for furnace brazing of aluminum and its alloys

SOURCE: Avtomaticheskaya svarka, no. 11, 1966, 40-43

TOPIC TAGS: aluminum alloy, ~~brazing~~, ^{metal} furnace brazing, brazing flux / F5 brazing flux /
AMg alloy, AMTs alloy, D20 alloy

ABSTRACT: A new F5 flux for furnace brazing of aluminum and aluminum alloys has been developed. The flux contains $45 \pm 0.5\%$ KCl, $38 \pm 0.5\%$ LiCl, $10 \pm 0.5\%$ NaF, $3 \pm 0.5\%$ SnCl₂, and $4 \pm 0.5\%$ CdCl₂, and is made by melting the components at 600—650C and grinding the cooled melt into powder. Aluminum-alloy specimens held in molten F5 flux at 450—600C for 10—60 min formed a thick surface layer (30—40 μ) which contained tin and cadmium reduced from the flux, the amount of which increased with increasing temperature and holding time. The amount of aluminum passed into the flux followed a similar pattern. The reaction between various aluminum alloys and molten F5 flux was only slightly affected by the alloy composition, and an average change in the weight of specimens in the reaction with F5 flux at 550C for 30 min was 0.0138—0.0180 g/cm². Molten F5 flux satisfactorily wetted the alloy surface and

Card 1/2

UDC: 621.791

ACC NR: AP6037097

produced much less pitting corrosion than the widely used 34A flux containing zinc chloride. Experience showed that F5 flux can be used advantageously for furnace brazing large thin-wall structures. The shear strength of AMTs alloy lap joints brazed with F5 or 34A flux was roughly the same, 9.0—10.2 kg/mm², depending on the filler material used. The strength of butt joints was 10.6—12 kg/mm². After six-month exposure in a humid atmosphere, the shear strength of AMTs alloy joints brazed with the 34A filler material and 34A and F5 flux decreased by 16 and 10%, respectively. Orig. art. has: 3 figures. [MS]

SUB CODE: 13, 11/ SUBM DATE: 25Apr66/ ORIG REF: 003/ ATD PRESS: 5109

Card 2/2

L 14969-65 EWT(m)/EWA(d)/EWP(t)/EWP(b) Pad ASD(m)-3/AFETR MJW/JD/HW/JG/MLX

ACCESSION NR: AT4048094

S/0000/64/000/000/0078/0083

AUTHOR: Blok, N.I., Glazova, A.I., Kozlova, M.N., Lashko, N.V., Morozova, G.I.,
Sorokina, A.P., Khromova, O.A.

TITLE: Comparison of methods for the phase separation of nickel chromium alloys

SOURCE: Spektral'ny*ye i khimicheskiye metody* analiza materialov (Spectral and chemical methods of materials analysis); sbornik metodik. Moscow, Izd-vo Metallurgiya, 1964, 78-83

TOPIC TAGS: nickel alloy, chromium alloy, phase separation, Alpha phase, carbide phase, electrolysis

ABSTRACT: The most widely used methods of electrolytic phase separation for heat-stable Ni-Cr alloys were investigated and compared. The baths proposed by different organizations for isolating the α -phase and carbide phase are as follows: 1. 10 g $(\text{NH}_4)_2\text{SO}_4$, 10 g citric acid, 1200 ml H_2O ; 2. 5 g $(\text{NH}_4)_2\text{SO}_4$, 15 ml HNO_3 , 35 g citric acid, 1000 ml H_2O ; 3. 3% $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 3.5% NaCl , 5% H_2SO_4 ; 4. 20 g CuSO_4 , 10 g sodium citrate, 5 ml H_2SO_4 , 1000 ml H_2O ; 5. anolyte: 10 g CuSO_4 , 1 g citric acid, 250 ml $\text{C}_2\text{H}_5\text{OH}$, 1000 ml H_2O ; catholyte: 10 g CuSO_4 , 10 g citric acid, 10 ml $\text{C}_2\text{H}_5\text{OH}$,
Card 1/3

L 14969-65

ACCESSION NR: AT4048094

2

1000 ml H₂O; 6. 100 ml H₃PO₄, 1000 ml H₂O. The current density in all cases was 0.05-0.07 amps/cm², for 60 minutes at room temperature. The chemical analysis of the χ -phase and anode residues is described in detail. Two heat-stable Ni-Cr alloys were used: EI437B (0.037 % C, 20.57% Cr, 2.75% Ti, 0.70% Al) and EI617 (0.056% C, 15.17% Cr, 3.67% Mo, 2.00% Ti, 5.30% W, 0.21% V, 1.70 % Al) under different conditions of tempering. As shown by tabulated data, the electrolytes used are suitable for the separation of the χ -phase. The electrolyte with a smaller amount of ethyl alcohol gives a slightly decreased amount of χ -phase. Variation in the pH from 0.8 to 2.6 does not affect the total amount of χ -phase. The phase separation proceeds most favorably in electrolytes containing 30 g of citric acid during electrolysis. X-ray data show that for EI437B, $\frac{1}{2}$ carbide of the type Ti(C,N) and Me₂₃C₆ and for EI617 $\frac{1}{2}$ carbide of the type TiC, Me₂₃C₆ and Ni_n (W, Mo, Cr_m)C are obtained. The best results were obtained with the VIAM bath (50 ml HCl 100 ml glycerol, 1000 ml CH₃OH, current density 0.05 amps/cm² 1 hr.) Orig. art. has: 4 tables and 1 figure.

ASSOCIATION: none

Card 2/3

L 14969-65

ACCESSION NR: AT4048094

SUBMITTED: 12Feb84

ENCL: 00

SUB CODE: MM, IC

NO REF SOV: 007

OTHER: 001

Card 3/3

U S S R

Leško, O. S. A new trigonometric method of computing
the distribution curve of the atoms of a liquid from X-ray
data. *Dopovidi Akad. Nauk Ukrain. RSR* 1953, 150-157
(1953) (Ukrainian. Russian summary)

15 277

LASHKO, O.S.

Structure of liquid bismuth-tin alloys. [with summary in English].
Dop. AN URSR no.1:30-32 '57. (MLRA 10:4)

1. Institut metalofiziki AN URSR. Predstaviv akademik AN URSR
G. V. Kurdyumov.
(Bismuth-tin alloys) (Liquid metals)

LASHKO, S. V.

see ~~LASHKO-AN~~
LASHKO-AN , S. V.

BOGDANOVA, V.V., inzh.; LASHKO, S.V., kand.tekhn.nauk; ROZENBERG, I.V., inzh.

Chemical heterogeneity of soldered seams. Svar.proizv. no.4:10-12
Ap '64. (MIRA 18:4)

35511-65

EPA(s)-2/EWP(k)/EWA(c)/EWT(m)/EWP(b)/T/EWP(v)/EWP(t)
JD/HM

2-4 10.00

ACCESSION NR: AP5007787

S/0119/65/000/003/0023/0024

AUTHOR: Grishin, V. L. (Engineer); Lashko, S. V. (Candidate of technical sciences)

TITLE: Specific features in soldering copper with gallium-base solders

24

SOURCE: Priborostroyeniye, no. 3, 1965, 23-24

8

TOPIC TAGS: copper, copper soldering, gallium base solder, soldering flux, solder, gallium solder, gallium copper powder solder

ABSTRACT: The effect of various factors in low-temperature soldering of copper parts with pure gallium or gallium-copper powder solder has been investigated. Pickling of the copper parts in a 10% solution of ammonium persulfate was found to be the best method of surface preparation. Of several fluxes tested, a mixture of zinc chloride (2 parts), fuming hydrochloric acid (1 part), and water (7 parts) produced the most satisfactory results. Pure-gallium solder yielded joints with a very low strength at both room and elevated temperatures. The best results were obtained with a solder containing 30 wt% copper powder (35-50 μ particles) kept at 180 for 3-4 days before use. The solder, preheated to 300, is painted over the surfaces to be joined and held for 6-8 hr at room temperature. This solder produces strong joints even without flux. The strength of soldered joints can be

Card 1/2

L 35511-65

ACCESSION NR: AP5007787

significantly increased by annealing at 50C for 6—8 hr, or for a shorter time at higher temperatures. For example, a joint annealed at 50C for 6 hr had a shear strength of 0.5 kg/mm², which increased to 6 kg/mm² with annealing at 650C for 1 hr. The high-temperature heating should be conducted in a vacuum. Orig. art. has: 3 figures. [MS]

ASSOCIATION: none

SUBMITTED: 00

NO REF SOV: 000

ENCL: 00

OTHER: 001

SUB CODE: MM, IE

ATD PRESS: 3217

Card 2/2

I 9679-66 EWT(m)/EWP(v)/T/EWP(t)/EWP(k)/EWP(b)/EWA(c) IJP(c) JD/HM
 ACC NR: AP5027600 SOURCE CODE: UR/0135/65/000/011/0018/0020

AUTHOR: Lashko, N. F. (Candidate of technical sciences); Lashko, S. V. (Candidate of technical sciences); Nikitinskiy, A. M. (Engineer)

ORG: none

TITLE: Furnace brazing of aluminum alloys

SOURCE: Svarochnoye proizvodstvo, no. 11, 1965, 18-20

TOPIC TAGS: metal brazing, aluminum alloy, corrosion, zinc chloride, soldering flux, fluoride / F5 soldering flux

ABSTRACT: It is shown that the brazing of aluminum alloys with the aid of zinc chloride-containing flux 34A is inexpedient, since then the surface layers of the aluminum get saturated with the zinc, which leads to chemical corrosion of the brazed metal and a deterioration in its plasticity. Accordingly, the authors investigated the applicability of other flux types to the brazing of AMts, AML, and AMg aluminum alloys, on proceeding from the premise that $ZnCl_2$ in the soldering fluxes should be replaced with the chlorides (or fluorides) of other metals which activize the flux without causing corrosion of the brazed metals -- aluminum and its alloys. A study of several experimental flux types containing no $ZnCl_2$ and consisting of the chlorides of lithium, potassium, tin, and cadmium, chlorides and sodium fluoride, was carried

Card 1/2

UDC: 621.791.354:669.715

L 9679-66

ACC NR: AP5027600

out: specimens of aluminum and its alloys were separately covered with these fluxes and rapidly heated in a furnace to the test temperatures -- 450, 500, 550, and 600°C, for 10, 20, 30, 40, 50, and 60 min. Subsequent mechanical tests showed that the best results are obtained with flux F5 (NaF 10%, SnCl₂ 3%, LiCl 38%, KCl 45%, CdCl₂ 4%), which prevents the pronounced erosion of the base metal on brazing with aluminum solders. It moreover assures a better joining of metal and improved penetration of solder into the pores and does not reduce the corrosion resistance and mechanical properties of the brazed joints. Further, it is shown that the most probable mechanism of the elimination of Al₂O₃ during the brazing of aluminum and its alloys is dispersion, conditioned by the stripping of the oxide film from the metal surface under the action of the gaseous products of the reaction between aluminum and the chlorides of the metals with a higher vapor pressure (AlCl₃, AlCl), as well as by the wetting of the oxide particles by the chlorides and fluorides of metals. Orig. art. has: 6 figures, 2 tables.

SUB CODE: 11, 13/ SUBM DATE: none/ ORIG REF: 002/ OTH REF: 002

Card 2/2

ASINOVSKAYA, G.A.; LAKEDEMONSKIY, A.V.; LASHKO, N.F.; LASHKO, S.V.

The terminology of soldering. Trudy VNIIVTOGEMASH no.12:
193-199 '65. (MIRA 18:11)

L 35868-66 EWT(m)/EWP(v)/I/EWP(t)/ETI/EWP(k) IJP(c) JD/HM/HW

ACC NR: AP6021004

SOURCE CODE: UR/0125/66/000/006/0041/0044

AUTHOR: Grishin, V. L. (Moscow); Lashko, S. V. (Moscow)

ORG: none

TITLE: The interaction of brazing alloys with titanium in diffusion brazing

SOURCE: Avtomaticheskaya svarka, no. 6, 1966, 41-44

TOPIC TAGS: titanium, titanium alloy, ~~titanium~~ brazing, ~~titanium alloy brazing~~, brazing alloy, silver alloy, copper alloy, nickel alloy, brazed joint structure, ~~brazed joint~~ strength / OT4 alloy, VT1 ~~alloy~~ titanium

ABSTRACT: Experiments have been made to determine the dependence of the chemical and phase composition and strength of silver, copper, or nickel-brazed joints in OT4 titanium alloy and VT1 titanium on the temperature of brazing, holding time, and the thickness of the silver, copper or nickel layers. OT4 and VT1 sheets, 0.4 mm thick, were brazed in an argon atmosphere or in a vacuum of $5 \cdot 10^{-4}$ mm Hg with vacuum-deposited silver, copper, or nickel layers 15 or 30 μ m thick or with 50- μ -thick foil inserts. The brazing was done at 960, 1000 or 1100C with a holding time of 1-240 min. In tests, all the brazed

Cord 1/3

UDC: 621.791.35 : 669.295

L 35868-66

ACC NR: AP6021004

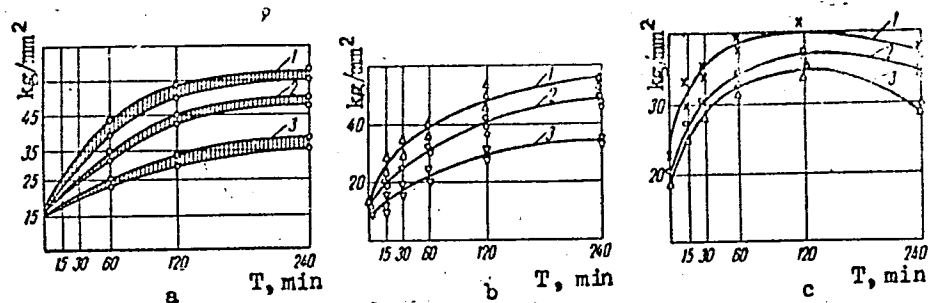


Fig. 1. Holding time dependence of the shear strength of OT4 alloy joints diffusion brazed with silver (a), copper (b) or nickel (c) at 1050C (1), 1000C (2) or 960C (3) in argon

joints, as a rule, failed at the joint or in the diffusion zone. The shear strength of all joints increased with increasing temperature and holding time. Under the same conditions, silver-brazed joints had the highest shear strength: 5—7 kg/mm² higher than that of copper brazed alloys and about 12—15 kg/mm² higher than that of nickel-brazed joints (see Fig. 1). Diffusion-brazing of titanium and titanium alloys with pre-deposited layers produces a shear strength 3—4 times higher than that achieved in conventional brazing with pre-placed silver-foil

Card 2/3

L 35868-66

ACC NR: AP6021004

6
inserts. In diffusion brazing during holding at brazing temperature, the components of brazing alloy (silver, copper, and nickel) diffuse into the base metal and form titanium-base solid solutions which have a higher hardness than the base alloy. Simultaneously with the diffusion of the filler alloy components into the base metal, titanium diffuses into the brazed joint, the brittle intermetallic compounds decompose, and the content of the filler alloy components in the joint decreases, thereby decreasing the hardness and increasing the strength of the joint. Orig. art. has: 4 figures and 1 table. [MS] 6

SUB CODE: 11, 13/ SUBM DATE: 19Nov65/ ORIG REF: 002/ OTH REF: 002
ATD PRESS: 5136

Card 3/3

ACC NR: AP6035753

SOURCE CODE: UR/0413/66/000/019/0124/0124

INVENTOR: Shebeko, N. G.; Lashko, S. V.; Svetlovidov, A. P.; Kamenskaya, Ye. A.;
Ivanov, Yu. M.; Tikhonova, Ye. B.; Shikh, R. B.

ORG: none

TITLE: Alloy for ¹⁰brazing refractory materials. ²¹Class 49, No. 186837

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 19, 1966, 124

TOPIC TAGS: refractory metal, ~~refractory metal~~, ~~refractory~~ metal brazing, brazing alloy

ABSTRACT: ²¹This Author Certificate introduces a niobium-base brazing alloy, containing titanium, ¹and vanadium, ¹for refractory materials. To improve the quality of a brazed joint, the composition of the alloy is set as follows: 20% vanadium, 10—20% titanium and the balance niobium.

SUB CODE: 11, 13/ SUBM DATE: 29Oct64/ ATD PRESS: 5106

Card 1/1

UDC: 621.791.36

ACC NR: AP6037097

SOURCE CODE: UR/0125/66/000/011/0040/0043

AUTHOR: Lashko, N. F. (Moscow); Lashko, S. V. (Moscow); Nikitinskiy, A. M.
(Gor'kiy)

ORG: none

TITLE: A flux for furnace brazing of aluminum and its alloys

SOURCE: Avtomaticheskaya svarka, no. 11, 1966, 40-43

TOPIC TAGS: aluminum alloy, ~~brazing~~, ^{metal} furnace brazing, brazing flux / F5 brazing flux
AMg alloy, AMTs alloy, D20 alloy

ABSTRACT: A new F5 flux for furnace brazing of aluminum and aluminum alloys has been developed. The flux contains $45 \pm 0.5\%$ KCl, $38 \pm 0.5\%$ LiCl, $10 \pm 0.5\%$ NaF, $3 \pm 0.5\%$ SnCl₂, and $4 \pm 0.5\%$ CdCl₂, and is made by melting the components at 600—650C and grinding the cooled melt into powder. Aluminum-alloy specimens held in molten F5 flux at 450—600C for 10—60 min formed a thick surface layer (30—40 μ) which contained tin and cadmium reduced from the flux, the amount of which increased with increasing temperature and holding time. The amount of aluminum passed into the flux followed a similar pattern. The reaction between various aluminum alloys and molten F5 flux was only slightly affected by the alloy composition, and an average change in the weight of specimens in the reaction with F5 flux at 550C for 30 min was 0.0138—0.0180 g/cm². Molten F5 flux satisfactorily wetted the alloy surface and

Card 1/2

UDC: 621.791

ACC NR: AP6037097

produced much less pitting corrosion than the widely used 34A flux containing zinc chloride. Experience showed that F5 flux can be used advantageously for furnace brazing large thin-wall structures. The shear strength of AMTs alloy lap joints brazed with F5 or 34A flux was roughly the same, 9.0—10.2 kg/mm², depending on the filler material used. The strength of butt joints was 10.6—12 kg/mm². After six-month exposure in a humid atmosphere, the shear strength of AMTs alloy joints brazed with the 34A filler material and 34A and F5 flux decreased by 16 and 10%, respectively. Orig. art. has: 3 figures. [MS]

SUB CODE: 13, 11/ SUBM DATE: 25Apr66/ ORIG REF: 003/ ATD PRESS: 5109

Card 2/2

NOVOZHILOV, M.G., prof.; TARTAKOVSKIY, B.N., kand. tekhn. nauk; GAVRILYUK,
I.I., inzh.; LASHKO, V.T., inzh.

Parameters of pile-forming conveyors equipped with a swivel-
component dumping device. Izv. vys. ucheb. zav.; gor zhur. 6
no.9:27-34 '63. (MIRA 17:1)

1. Dnepropetrovskiy ordena Trudovogo Krasnogo Znameni gornyy
institut imeni Artema. Rekomendovana kafedroy otkrytykh rabot.

TARTAKOVSKIY, B.N.; GAVRILYUK, I.I.; LASHKO, V.T.

Efficient operations diagram of a revolving, link-type dump piler.
Ogneupory 29 no.4:172-176 '64. (MIRA 17:4)

1. Otdeleniye gornorudnykh problem AN UkrSSR.

9

CA

Reversible and irreversible processes in the recovery phenomena in aging alloys. S. V. Avakyan and N. P. Lashko. *Doklady Akad. Nauk S.S.S.R.* 50, 255-7.

(1945).—Wt. loss and intercryst. penetration after 3-days' exposure in a soln. of 2 cc. of HCl and 3 g. of NaCl in 100 cc. of H₂O were used as the evidence that the recovery of the as-quenched hardness of naturally aged duralumin on heating for about 1 min. at 240-270° is the result of a process essentially the same as artificial aging rather than the soln. of the small particles responsible for natural age hardening. The alloy aged naturally after quenching from 800° showed no intercryst. corrosion and only 0.006 g./sq. cm. wt. loss. The strength fell on heating this alloy at 240° and reached a min. after 1 min. This is the recovery process. After 1 min. the wt. loss was 0.055 g./sq. cm. and the depth of intercryst. penetration was 0.35 mm. At 270° recovery occurred in 22 sec. and the corresponding values after 1 min. were 0.115 g./sq. cm. and 0.64 mm. The corrosion values increased monotonically with time in almost the same manner in artificially aged specimens and in those given the recovery treatment. A. G. Guy

COMMON ELEMENTS																										PROCESSES AND PROPERTIES INDEX																									
MATERIALS INDEX																										METALLURGICAL LITERATURE CLASSIFICATION																									
<p>On the Representation of a Four-Component System on a Surface. S. V. Avakyan and N. F. Lashko (<i>Zhur. Fiz. Khim.</i>, 1946, 20, (12), 1480-1491).— [In Russian]. Some developments of the method proposed by A. A. Kochvar (<i>Izv. Akad. Nauk S.S.S.R.</i>, 1944, [Tekhn.], (12), 851; see <i>Met. Abs.</i>, 1946, 13, 8).—N. A.</p>																										<p>2</p>																									

AVAKYAN, S.V.

Sofya Vasil'yevna

PHASE I

TREASURE ISLAND BIBLIOGRAPHICAL REPORT

AID 603d - I

BOOK

Call No.: TL504.M63

Authors: AVAKYAN, S. V., Eng. and LASHKO, N. F., Kand. of Tech. Sci.

Full Title: PROBLEM OF STRUCTURAL TRANSFORMATIONS IN PIG IRON. In:
Moscow Aviatsionnyi Tekhnologicheskii Institut. Trudy.
Issue 4, 1948

Transliterated Title: K voprosu o strukturnykh prevrashcheniyakh
v chugunakh

PUBLISHING DATA

Originating Agency: Moscow Aviation Technological Institute

Publishing House: State Publishing House of the Defense Industry
(Oborongiz)

Date: 1948

No. pp.: 7 (68-74)

No. of copies: Not given

Editorial Staff

Ed.-in-Chief: Voronov, S. M., Prof., Doc. of Tech. Sci.

PURPOSE: For scientific workers in aviation technology and materials.

TEXT DATA

Coverage: This is a report on the authors' survey of the methods of
thermal processing of pig iron in order to obtain the highest re-
sistance to corrosion. During this research they studied the mech-
anism of structural transformations in pig iron at different tempera-
tures. Diagrams, photos, charts.

No. of References: None

Facilities: None

1/1

AVAKYAN, S. V.

PHASE I TREASURE ISLAND BIBLIOGRAPHICAL REPORT AID 603e - I

BOOK

Call No.: TL504.M63

Authors: AVAKYAN, S. V., Eng. and LASHKO, N. F., Kand. of Tech. Sci.

Full Title: CONDITIONS OF THE FORMATION OF EUTECTICS. In: Moscow
Aviatsionnyi Tekhnologicheskii Institut. Trudy. Issue 4,
1948

Transliterated Title: Ob usloviyakh obrazovaniya evtektiki

PUBLISHING DATA

Originating Agency: Moscow Aviation Technological Institute

Publishing House: State Publishing House of the Defense Industry
(Oborongiz)

Date: 1948 No. pp.: 8 (75-82) No. of copies: Not given

Editorial Staff

Ed.-in-Chief: Voronov, S. M., Prof., Doc. of Tech. Sci.

PURPOSE: For scientific workers in aviation technology and materials.

TEXT DATA

Coverage: In their consideration of the kinetics of crystallization of eutectic alloys, the authors follow the theory according to which at cooling temperature nearing crystallization, some parts in liquids appear to be arranged more orderly than the others. Those more-arranged parts become embryos of crystallization and gradually induce solidification of the liquid metal. At the end of the article

Ob usloviyakh obrazovaniya evtektiki

AID 603e - I

a table gives the theoretical and actual positions of the eutectic point for various binary eutectic systems of some metals.

No. of References: 6 Russian, 1935-1945

Facilities: Names of several Russian scientists appear in the text.

2/2

AVAKYAN, S. V.

PA 38/49T91

USSR/Metals
Eutectics
Alloys

Mar 49

"The Nature of Eutectic Alloys," S. V. Avakyan,
N. F. Lashko, All-Union Inst of Aviation
Materials, 9 pp

"Zhur Fiz Khimii" Vol XXIII, No 3

Discusses system of three principles which are
required for formation of eutectic rather than
other types of alloys: homogeneity, contactivity,
and equal probability. Latter involves the
probability of initial formation of nuclei
of liquid eutectic alloy being equal in all phases
Submitted 30 Apr 48. 38/49T91

PA 52/49T14

USSR/Chemistry - Alloys
Chemistry - Crystallization

Jun 49

"On the Nature of Eutectic Alloys: II, Eutectic Crystallization in the Presence of Surface-Active Substances," C. V. Avakyan, N. F. Iashko, Inst of Avn Materials, Moscow, 6 1/2 pp

"Zaur Fiz Khim" Vol XXIII, No 6

Tabulates results of introducing sodium-taurocholate, Nektal aerosol IB, and agar-agar in amounts of 0.005 - 0.1 percent into water solutions to increase fineness and number of crystals obtained from binary saline eutectic $K_2Cr_2O_7-KCl$. These

52/49T14

USSR/Chemistry - Alloys (Contd)

Jun 49

surface-active substances effect a change in the eutectic point. Submitted 27 Jul 48.

AVAKYAN, C. V.

52/49T14

AVAKYAN, S.V.

00,49721

USSR/Chemistry - Eutectics
Chemistry - Crystallization

Jul 49

"The Nature of Eutectic Alloys: III, Modification of Binary Eutectics," S. Avakyan, N. Iashko, All-Union Inst of Adv Materials, Moscow, 42 pp

"Zhur Fiz Khim" Vol XXIII, No 7

Addition of stearic acid to eutectic camphor-naphthalene results either in breaking down the needlelike structures of naphthalene (in the case of a very small addition) or a modification of the form of the naphthalene crystals (in the case of large additions). Ratio of linear rates of

60/49721

USSR/Chemistry - Eutectics (Contd)

Jul 49

crystallization of camphor and naphthalene are modified also. Includes pictures of crystals. Submitted 30 Sep 48.

60/49721

AVAKYAN, S. V.

USSR/Chemistry - Alloys

Chemistry - Crystallization

Feb 49

"Eutectic Crystallization in the Presence of Surface-Active Substances," S. V. Avakyan, N. F. Iashko, 4 pp

"Dok Ak Nauk SSSR" Vol LXIV, No 6

In studying crystallization of metallic, eutectic alloys, a unique structure is sometimes observed, different from normal laminary or polyhedral structure of eutectics. One stage, which goes into the eutectic, it appears the second stage, so that on a plane surface it appears as a ring of one stage around another. To clarify the nature of this eutectic crystallization, authors created artificial conditions which

facilitate appearance of the unique structure by adding surface-active materials. Submitted by Acad. P. A. Rebrinder, 17 Nov 48.

29/4919

A

The nature of eutectic alloys. H. V. Arakyan and N. P. Lashko. *Doklady Akad. Nauk S.S.S.R.* 63, 29-32 (1940); cf. *C.A.* 43, 6154c. — Eutectic alloys are governed by 3 principles: (1) the principle of homogeneity of compn., (2) of common contact between phases, and (3) of equal probability of creation of crystn. germs for all phases. Expts. in which 2 metals, one or both of which can be eutectic alloys, are brought into contact and heated to beginning fusion at their contact boundary, show that melting begins at $5-10^\circ$ above the eutectic temp. of the total system. Examples are (m. temps. of the sep. phases in parentheses) Pb (327)/Bi (271), m. at $130-5^\circ$; Sn-Pb eutectic (183)/Bi (271), m. $100-5^\circ$; Pb-Cd eutectic (248)/Bi (271), m. $95-100^\circ$; Pb-Cd-Sn eutectic (145)/Bi (271), m. $75-68^\circ$; Pb-Sn eutectic (183)/Cd-Bi eutectic (144), m. $75-68^\circ$. The metal molten at the contact boundary contains all the phases of the eutectic. Although it is possible to obtain in this way up to a quaternary eutectic, 5-phase or higher eutectics could not be made by contact. The nonexistence of

eutectics with a no. of phases higher than 4 does not follow from either the 1st or the 2nd of the principles stated at the outset, as it can be shown that topologically the contact principle can be safeguarded in the presence of 4 phases. However, the very small probability of eutectics with more than 4 phases can be derived from the 3rd principle. The classic probability P_m of finding m objects the distribution of N objects over m_0 vols., if the probability P of incidence in any one of these vols. is equal for all the objects is $P_m = C_{N-m} P^m (1-P)^{N-m}$. For $P = k/N$ (where k = mean no. of objects per unit vol.), this goes over into Poisson's relation $P_m = (k^m/m!) e^{-k}$. Consequently, the probability of co-existence of germs of m phases is $P_m = 1/m!$. Numerical evaluation of the ratio P_m/P_2 from the above considerations gives, for $m = 2, 3, 4, 5, 6$, $P_m/P_2 = 1, 0.3333, 0.0833, 0.0166, 0.0028$, which compares satisfactorily with the exptl. relative nos. of m -phase eutectics, 1, 0.2857, 0.1020, 0.02, —. The exptl. nonexistence of eutectics with $m > 4$ is thus the result of their extremely low probability under the 3rd principle. N. Thon

AVAKYAN, S. V.

PA 167T84

USSR/Metals - Welding

Oct 50

"Primary Structure and Causes for Crack Formation in Welding of Cromansil," S. V. Avakyan, N. F. Iashko, Cand Tech Sci

"Avtogen Delo" No 10, pp 13-16

Investigators detected in welded joint of Cromansil a network which can be revealed only by etching with certain solutions. Established that revealing of this structure takes place with simultaneous presence of sufficient quantities of carbon and silicon and cracks form in places of greatest silicon concentration. Five

167T84

USSR/Metals - Welding (Contd)

Oct 50

zones, differing in character of structural transformations discussed for gas welding of 30 KhGSA-type sheet steel.

167T84

2381* Primary Structure and Causes of Formation of Cracks During Welding of Chromanill Steel. (In Russian) S. V. Avakyan and N. F. Lashko. *Autogennoe Delo* (Welding). v. 21, Oct. 1950, p. 13-16.

Methods of metallographic etching to reveal the structure of above weld metal and causes of crack formation were investigated. Study of 5 zones of thermal influence of welding shows that intensity and time of heating during atomic-hydrogen welding are intermediate between those present during arc and gas welding. Includes a series of micrographs.

9

C.A.

The nature of eutectic alloys. IV. Monocrystalline phase in binary eutectics. S. V. Ayakyan, E. N. Kislyakova, and N. F. Lashko (All-Union Inst. Aviation Materials, Moscow). *Zhur. Fiz. Khim.* 24, 1057-60 (1950); cf. *J.A.* 43, 8832d.—The eutectics of Ni-Al, Bi-Sn, and Sn-Cd were studied by x-ray diffraction. Paul W. Howerton

AVAKYAN, S.V.

USSR/Engineering - Welding.

May 51

"On the Weldability of Aluminum-Magnesium Alloys"
S. V. Avakyan, N. F. Lashko, Candidates Tech Sci

"Avtogen Delo" No 5, pp 9-13

Conducted investigation of causes for increased porosity in weld zone of 5% Mg Al-base alloy (AMG-5) in 3 directions: microscopic analysis of welds, influence of heating and its rate on structure modifications in alloy and study of the betaphase stability during the heating period. Discusses results and makes suggestions for improvement.

200T29

USSR/Metals - Aluminum, Welding, Properties Oct 51

"Effect of the Chemical Composition of Certain Binary Aluminum-Base Alloys on Their Tendency to Crack Formation in the Gas-Welding Process," S. V. Avakyan, N. F. Lashko, Candidates Tech Sci

"Avtozen Delo" No 10, pp 1-6

Investigates crystn cracks and conditions for their formation of alloys of Al with Sn, Cu, Mg, Zn, Ag, Si, Mn, Fe, Bi, Cd and Ce. Elimination of cracks may be achieved under following conditions: insignificant difference in crystn temps of Al and eutectic; small amt of 2d phase in

202180

USSR/Metals - Aluminum, Welding, Properties (Contd) Oct 51

eutectic distributed along grain boundaries of solid soln in form of sep inclusions; sufficient quantity of eutectic to "heal" fissures formed in alloy during crystn.

202180

AVAKYAN, S. V.

Avakyan, S.V.

V. 124/11110(OT 1318) 521,791,5 :559,715,018,62 ①
The Effect of Chemical Composition Avto, Delo.
of Some Binary Aluminium Alloys on 22(10)
their Cracking Tendency in Gas Welding 1951 NG
 S.V. Avakyan, N.P. Lashko U.S.S.R.
 The examination of Al-base alloy systems resulted in the
 conclusions that Solidification Cracks are avoided under
 the following conditions: (i) a small melting point
 difference between the Al and the eutectic; (ii) a small
 amount of second phase in the eutectic, distributed as
 separate inclusions along the solid solution grain
 boundaries; (iii) when the alloy contains sufficient
 eutectic, allowing the solidification cracks to "heal" up.
 (Bibl. 2)
 (B.S.A. Transl., 10pp.)

gm
 of

AVAKYAN, S. V.

✓ 185/1110(OT 1320) 621,791,5 :669,715,018,62
The Effect of the Composition of
Aluminium Alloys on Their Tendency
to Cracking During Gas Welding
S.V. Avakyan, N.F. Lashko
Arto, Delo.
22(14)
1951 MG
U.S.S.R.
It is maintained that aluminium alloys can be welded
without cracking if a suitable filler metal of lower
melting point than the parent metal is selected.
(B.S.A. Transl., 5pp.)

for

CA

2

Effect of increasing the structural viscosity on the process of crystallization of binary eutectics in ternary systems. S. V. Avakyan and N. P. Lashko. *Zhur. Fiz. Khim.* 25, 480-2 (1951).—As a part of a systematic study of all factors affecting the crystn. of binary eutectics (C.A. 45, 1000g), the effect was investigated microscopically of adding 0.15 wt. % of agar-agar to the systems $KCl-K_2Cr_2O_7-H_2O$ and $KNO_3-NaNO_3-H_2O$ so as to suppress convection and concn. gradients. This addn. favors dendritic growth of one of the eutectic phases but does not change the character of the crystn. process. In this respect, the suppression of convection and concn. gradients acts differently from the increase of undercooling. . . .

Michel Boudart

2

CA

Crystallisation of binary eutectics in ternary systems.
S. V. Avakyan and N. P. Lashko. *Zhur. Fiz. Khim.* 25,
1085-91 (1951).—A microscopic investigation of the systems
KCl-K₂Cr₂O₇-H₂O, KNO₃-NaNO₃-H₂O, Al-Si-Sn, Ag-Cu-
Bi, Cd-Sn-Bi, and Cd-Zn-Sn leads to the conclusion that
the mechanism of formation of binary eutectic structures
in ternary systems is very similar to that governing eutectic
formation in binary systems. Special features are due to
the fact that in ternary systems, eutectic crystn. takes place
within a given range of temp. and concn. During crystn.
the compn. of the liquid changes and approaches the compn.
of the ternary eutectic. This ought to affect the linear
velocity of crystn. of the binary eutectic (Tammann).
The presence of the third component ought to decrease the
no. of grains of the binary eutectic, since crystn. takes place
in a larger sp. vol. In a ternary system, the grains should
be bounded preferentially by curves instead of by plane
surfaces, since the third component decreases the anisotropy
of cryst. growth.

Michel Boudart

1952

AVAKYAN, S. V.

USSR/Engineering - Welding

Jan 52

"Concerning the Weldability of Metals," S.V.
Avakyan, N.F. Lashko, Candidates Tech Sci

"Avtogen Delo" No 1, pp 29-32

Discusses definition of metals' weldability and outlines conditions required for realization of welding process which is considered as interatomic cohesion by diffusion. Analyzes welding process discussing crystn of welded joint and changes in properties of base metal under effect of welding heat. Shows microstructure of Bi welded with admixt of Cd and Sn in 3 micrographs and discusses welding of unlike metals.

212T18

PA 233T43

AVAKYAN, S. V.

USSR/Metallurgy - Welding, Crystallization Jul 52

"On Discontinuous Crystallization in the Welding Process," S.V. Avakyan, N.F. Lashko, Candidates Tech Sci

"Avtozen Delo" No 7, pp 25-28

Briefly reviews Soviet tech literature on subject and disputes periodicity of crystn in welded joints accepted as an established factor by some investigators. Concludes that discontinuity of crystn during welding is conditioned by (1) balance between heat delivered to boundary

233T43

of solid and liquid phases and (2) heat loss. Substantiates this assumption by crystn of salol under conditions similar to those of welding.

233T43

AVAKYAN, S.V.

Metallurgical Abst.
Vol. 21 A pr. 1954
Structure

"Non-Equilibrium Crystallization During Welding (of Aluminum Alloys). S. V. Avakyan, N. F. Lashko, and O. P. Shlykov (Arleg. Delo, 1953, 24, (6), 12-16).—[In Russian].
Crystn. of metals and alloys during welding does not take place along the equilibrium lines, owing to rapid heating, melting, and cooling of the welds. Crystn. in two series of alloys, one contg. Al with 0.05-8% Cu and the other contg. Al with 0.01-3% Si, was studied. During cooling at the rate of 80°-100° C./sec., the limited solubility of Cu in Al was reduced from 5.65 to 0.2% and that of Si in Al from 1.65 to 0.05%. During slower cooling (10°-12° C./sec.), the corresponding reduction of solubility was from 5.65 to 2% for Cu and from 1.65 to 0.2% for Si. The alloys most strongly inclined to form the "hot" cryst. cracks are alloys of Al-Cu and Al-Si contg. 4-5% of eutectic.—S. K. L.

LASHKO-AVAKYAN, S.V.

LASHKO, N.F.; LASHKO-AVAKYAN, S.V.; POGODIN-ALEKSEYEV, G.I., doktor tekhnicheskikh nauk, professor, redaktor; POPOVA, S.M., tekhnicheskiiy redaktor

[Metallography of welding; some problems] Metallovedenie svarki; nekotorye voprosy. Pod red. G.I. Pogodina-Alekseeva. Moskva, Gos. nauchno-tekhn. izd-vo mashinostroitel'noi lit-ry, 1954. 270 p.
(Welding) (Metallography) (MLRA 8:4)

LASHKO-AVAKYAN, S.V., kandidat tekhnicheskikh nauk; LASHKO, N.F., kandidat tekhnicheskikh nauk; ORIOVA, V.V., inzhener.

Intercrystalline cracks in aluminum alloy weldings. Svar.proizv.
no.1:13-18 Ja '55. (MLRA 9:4)

(Aluminum alloys--Welding)

LASHKO-AVAKYAN, S.V.

✓ The causes of the formation of heat cracks and methods for preventing them. N. F. Lashko and S. V. Lashko-Avakyan. *Aviomet. Sparka* 8, No. 2, 66-78 (1965). It is shown that the formation of heat cracks and the extent of their development are governed by certain basic factors, namely, (1) the change in vol. during crystn. of the weld metal, (2) the speed of solidification, and (3) the duration of liquid layers in the crystg. weld metal. In binary and ternary systems of Al alloys the resistance to the formation of heat cracks is increased if the amt. of light alloy eutectic does not exceed 3-5% by vol. This resistance is extremely low when the per cent of eutectic is increased to 15%.
J. R. Behrman

① *Aviation Materials*
A-U Sci Res Inst

LASHKO, S.I., kand. tekhn. nauk; LASHKO, N.P., kand. tekhn. nauk

Reply to the article by I.I. Il'yevskii "Drawback of research
papers on welding." Sov. proizv. no.5-59-40, 45 My '62.
(MIRA 18:11)

PERIODICAL ABSTRACTS

Sub.: USSR/Engineering

AID 4183 - P

LASHKO-AVAKYAN, S. V., N. P. LASHKO, and V. V. ORLOVA.
MEZHKRISTALITNYYE TRESHCHINY V SVARNYKH SOYEDINENIYAKH IZ
ALYUMINEVYKH SPLAVOV (Inter-crystal Fissures in Welded Junctions
of Aluminum Alloys). Svarochnoye proizvodstvo, no. 1, Ja 1956:
13-18.

These authors present results of their research and the experiments of other scientists on causes of crystallization and occurrence of fissures in welded junctions of aluminum alloys. They describe two devices for determination of the deformations occurring in metals and alloys resistance to crystallization. Results obtained in these delicate experimentations are analysed and practical suggestions made. Two sketches, 5 graphs and 6 microphotographs ("Fractographs"). 7 Russian, 4 non-Russian references.

LASHKO-AVAKYAN, S.V.

AUTHOR:

LASHKO, N.F., LASHKO-AVAKYAN, S.V.

PA - 2160

TITLE:

The Technological Strength of a Welded Joint in the Crystallization Process. (Tekhnologicheskaya prochnost' svarnogo soedineniya v protsesse kristallizatsii, Russian)

PERIODICAL:

Izvestiia Akad.Nauk SSSR, Otdel.Tekhn. 1957, Vol , Nr 1,

pp 103-114 (U.S.S.R.)

Received: 3 / 1957

Reviewed: 4 / 1957

ABSTRACT:

The technological strength of a welded joint during a welding process is investigated. It is shown that, for explaining mechanical characteristics of a body cooling down in the solid-liquid state, it is sufficient, in the case of not high deformation velocities, to proceed from the properties of the solid crystalline body, while the resistance of the liquid phase against elongation may be neglected. In the case of welding by melting the peculiarities of crystallization must be taken into account. In the course of crystallization also the section of the melt to be welded in the zone of thermal influence participates in the process. The change of the strength of the melt occurs spontaneously without any exterior action. Destruction of the welding seam in solid-liquid form takes place with the participation of deformations by elongation. Experiments showed that, in the case of melts of the eutectic type, the width of the interval of crystallization depends essentially on the composition

Card 1/2

PA - 2160

The Technological Strength of a Welded Joint in the Crystallization Process.

of the melt and on the velocity of crystallization. In melt-systems with the formation of inconstant chemical compounds, peritectic reaction cannot develop to the end if cooling is rapid, and crystallization ends by the formation of a small quantity of a labile eutectic. The occurrence of the latter and the drop of temperature on the occasion of the joining of the dendrites on the occasion of the crystallization of these melts is the reason for their pronounced tendency to form a crystallization gap. It may be assumed that part of the melts of the system under investigation undergoes peritectic reaction. (6 illustrations and 2 tables).

ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED: 22. 6. 1956
AVAILABLE: Library of Congress

Card 2/2

PHASE I BOOK EXPLOITATION

SOV/3711

Lashko-Avakyan, Sof'ya Vasil'yevna, Candidate of Technical Sciences,
and Nikolay Fedotov, Candidate of Technical Sciences.

Payka alyuminiyevykh splavov (Soldering of Aluminum Alloys) Moscow,
1958. 25 p. (Series: Peredovoy opyt proizvodstva. Seriya
"Mashinostroyeniye," vyp. 14) 5,000 copies printed.

Sponsoring Agencies: Moskovskiy Dom nauchno-tekhnicheskoy propagandy
imeni F.E. Dzerzhinskogo; Obshchestvo po rasprostraneniyu politicheskikh i nauchnykh znaniy RSFSR.

Ed.: S.P. Filippova; Tech. Ed.: R.A. Sukhareva.

PURPOSE: This book is for solderers.

COVERAGE: The book discusses the difficulties in soldering aluminum,
the methods of soldering and various solders for aluminum alloys
for soldering in the temperature range up to 400°C and from 400
to 620°C. There are 12 references: 3 Soviet, 6 English, 1 German,
and 2 French.

Card 1/2

Soldering of Aluminum Alloys

SOV/3711

TABLE OF CONTENTS: None given [book divided as follows]:

Preparation of product for soldering	8
Soldering of aluminum and its alloys at temperatures up to 400°C	10
Soldering of aluminum and its alloys in the temperature range from 400 to 620°C	19
Bibliography	27

AVAILABLE: Library of Congress

Card 2/2

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AUTHORS:

Lashko, N.F., and Lashko-Avakyan, S.V.

SOV-125-58-9-14/14

TITLE:

The Role of Carbide Phases and Initial Ferrite in the Formation of Crystallization Cracks While Welding Austenitic Steels (O roli karbidnykh faz i pervichnogo ferrita v obrazovanii kristallizatsionnykh treshchin pri svarke austenitnykh staley)

PERIODICAL:

Avtomaticheskaya svarka, 1958, Nr 9, pp 98-110 (USSR)

ABSTRACT:

The effect of alloying on the proneness to crystallization cracks in welded austenitic steels is discussed. Basic factors determining such proneness of weld joints, connected with alloying of the seams, include the effects of alloying elements on: 1) changes in the crystallization interval of austenitic steels; 2) formation of a non-equilibrium fusible eutectic between the dendrite axes and at the grain borders; 3) shrinkage phenomena in crystallization; 4) the initial grain size, forming during crystallization; 5) ferrite formation in crystallization of austenitic steels. The effect of carbon, chromium, nickel, silicon, tungsten, molybdenum, titanium, vanadium and niobium on proneness to crystallization cracks in austenitic steel is analyzed. It is stated that intermetallic phases, formed in the case of a considerable content of alloying elements (such as tungsten,

Card 1/2

SOV-125-58-9-14/14

1. The Role of Carbide Phases and Initial Ferrite in the Formation of Crystallization Cracks While Welding Austenitic Steels

titanium, niobium and aluminum) do not have a substantial effect on crystallization crack formation, whereas carbide and boride phases are of basic importance. In pure austenitic steels, in particular in the case of a columnar structure, vanadium, titanium and niobium can increase proneness to crystallization cracks; in the case of a bi-phase structure ($\gamma + \delta$) created by these or other ferrite-forming elements, such as chromium, molybdenum, tungsten and silicon, proneness to crystallization cracks can be depressed. The positive effect of an initial ferrite phase in austenitic steels on their sensitivity to crystallization cracks is explained by taking into account the effect of the ferrite phase, on the aforementioned basic factors.

There are 5 microphotos, and 13 references, 11 of which are Soviet and 2 English.
June 14, 1957

SUBMITTED:

1. Steels--Fracture
2. Welding--Metallurgical effects
3. Steel
- Crystallization
4. Steel--Properties

Card 2/2

USCOMM-DD-55674

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PLAS I BOOK EXPLANATIONS

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